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PLEASE PRESERVE THIS PAMPHLET.

Thirty minutes spent in reading it may be worth thousands of dollars to you.

This Edition especially for Engineers and Architects

6080 aa 1

The Rusting of Iron and Steel

HOW IT MAY BE PREVENTED

AND

HOW IT IS PROMOTED.

FROM

The Prince Manufacturing Co.,

71 MAIDEN LANE, N. Y.

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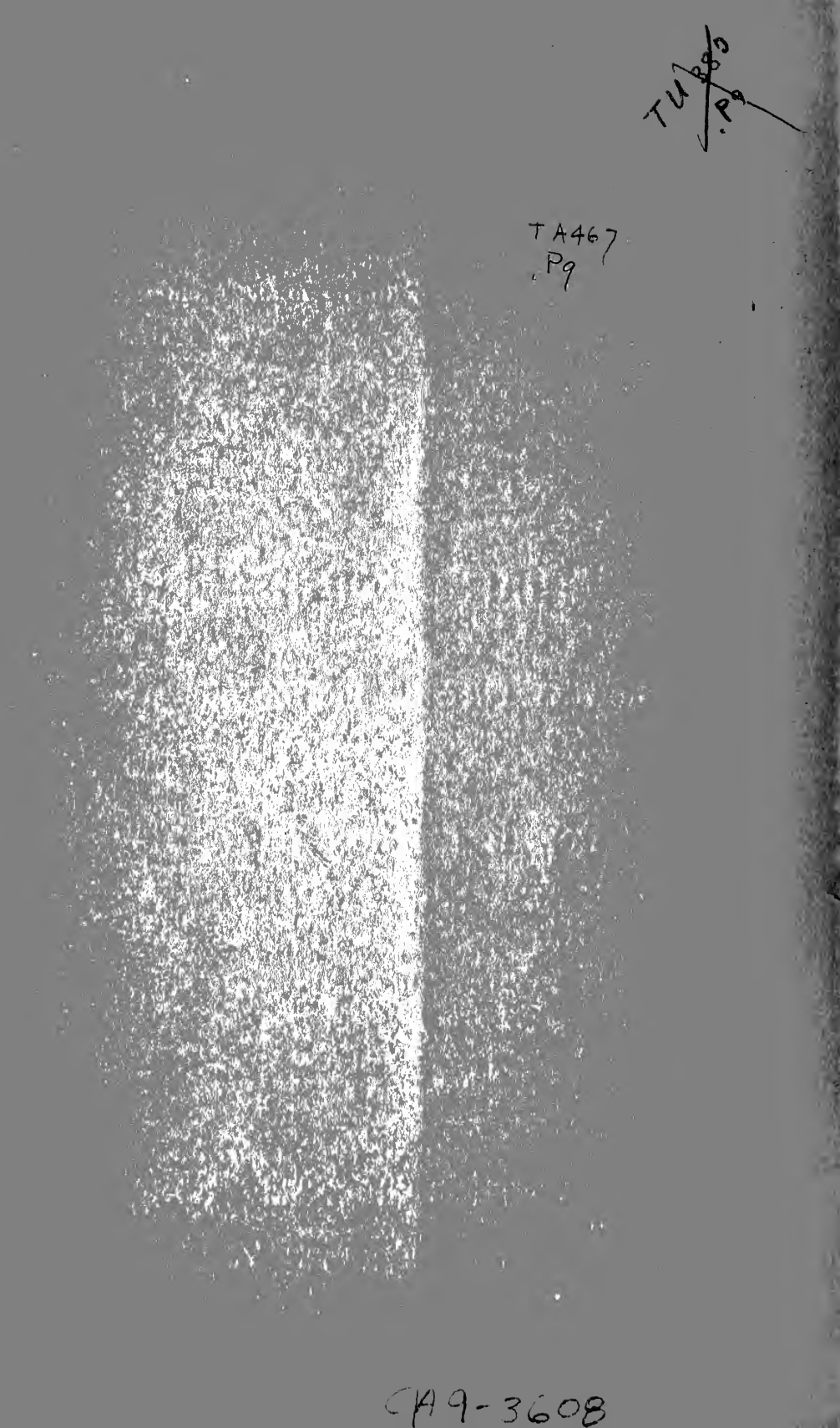

CA9-3608

"A Double Label"

"Is Our Trade Mark."

The Prince Bros.' Mineral Brown,

FORMERLY CALLED

PRINCES' METALLIC PAINT,

IS MADE EXCLUSIVELY BY

The Prince Manufacturing Co.,

A. C. PRINCE, PREST. DAVID PRINCE, SEC'Y & TREAS.

71 MAIDEN LANE,

NEW YORK.

DOUBLE LABELS ARE OUR TRADE MARK.

"A Double Label"

"Is Our Trade Mark."

(COPYRIGHT JANUARY, 1895, BY THE PRINCE MANUFACTURING CO.)

The Best Paint for the Preservation of Iron and Steel from Rust and Corrosion is

PRINCE BROS' MINERAL BROWN

FORMERLY CALLED

PRINCES' METALLIC PAINT.

The Iron Ore used for making PRINCE BROS.' MINERAL BROWN is of a blue gray color. It is found in veins from 6 to 15 inches thick, between strata of Hydraulic cement stone.

It is Roasted. The paint ore is broken into small fragments and carefully roasted with wood. During this process Carbon Dioxide is expelled, and the Iron while red hot absorbs Oxygen and is changed into PEROXIDE OF IRON, *the highest possible form of iron oxide*. No further change can take place in this by exposure to the air or moisture, no matter how long this may be continued.

Unchangeable. It is this quality of *unchangeability* that makes the *Peroxide of Iron* the most valuable source of *durable color*.

Insoluble. "Having been kept for many hours at a high temperature, it becomes practically insoluble in acids."

Chemical Symbol. Its chemical symbol is Fe_2O_3.

Loss in Roasting. The ore loses about 30% in weight by being roasted. It is then carefully examined, and pieces not sufficiently roasted, or roasted too much, are rejected. It is then crushed into fragments the size of wheat.

Ground Fine. Ground in mills specially made for the purpose into an impalpable powder, packed in new barrels, marked with the *net* weight, labeled with *our double label*, stenciled with our name and address on the side, and is ready for sale.

Prince Bros.' Mineral Brown is of such a gravity and so finely ground that it does not settle in oil, or become hard or caked. It does not fade, scale, chalk, or crack. Mixed with pure Linseed Oil, it is elastic, waterproof, and not affected by dust, smoke or cinders.

Is a Filler. The first coat acts as a filler upon wood or iron. It produces *no sediment, grit or waste*, does not harden in the painter's pot.

Adhesive. It adheres so strongly to iron, tin or wood, that after it has had time to dry thoroughly, it is almost impossible to remove it. It is the best possible

Primer—when other colors are desired, which may be painted over it.

Its Color is a rich Red Brown, which is quite uniform.

Silica. It contains about 25% of Silica, one of the best fillers known.

Healthful. It is absolutely *non-poisonous*, and may safely be used upon roofs where the water is used for drinking, or upon the inside as well as outside of water tanks.

Is Durable. *It lasts so long unchanged* that painters sometimes object to it for this reason, as it makes their services less frequently required than when other paints are used.

Prince Bros.' Mineral Brown. If a 300 lb. barrel of the dry pigment is put into a large tub, 40 gallons of Linseed Oil poured onto it and *let alone* for 12 hours that the oil may soak into and *saturate* the dry pigment, as it will do, then it may be stirred up by hand and will be found suitable for use to the last particle. There will be no sediment or grit. The paint ready for use will measure out one-fifth more gallons than the number of gallons of oil used.

Covering Power. One gallon of paint made in this way will cover well with one coat 700 square feet of iron, steel or tin, and *its durability* is greater than that of any other paint.

Harmless. There is nothing in it that can injure Linseed Oil. Together they make an Ideal Paint that is adhesive, waterproof, elastic, durable and economical.

It is Cheap, in the true sense of the word, meaning that at a small cost it covers a large amount of surface, does its work well, and lasts for many years.

Mortar Color. It is largely used for this purpose, as it is so strong in coloring power that it goes a great way and improves and strengthens the mortar or cement.

For Structural Work of Iron or Steel, with pure Linseed Oil *it should always be used;* there is no other paint made that has the same *preservative* property. Its use should be made universal for this purpose, as *great loss of property and life* may in this way be prevented.

Light Houses along the Atlantic Coast *are painted with it* for a first coat *for its preservative properties,* and *then* covered with other colors.

Prince Bros.' Mineral Brown (*formerly* called Princes' Metallic Paint) was first sold from 1858 to 1870 by Robert Prince (the original manufacturer), at five cents per lb. for barrel lots and four cents lb. for ton lots. Since then the price has been steadily reduced, as the demand for it increased, while *the quality* has been improved, until now it can be bought by the ton at the works for $25.00 to $20.00 according to quantity, and by the barrel for 1¾ cents lb.

Steadily Improved. By the use of improved furnaces and milling machinery made especially for us, the quality of this paint has been kept up to the highest standard, so that for fifteen years it has stood at the head of all dry pigments made in this country.

Uniform Color. It is all made of a Uniform Color, a Red-Brown. If it were possible to make it in very light shades, or white, it would quickly take the place of all light colored paints, as it possesses so many excellent qualities which they lack.

Adhesive. When mixed with pure Linseed Oil it is so adhesive to Iron or Steel that when dry it can hardly be scraped or sandpapered off, and is a complete protection against rust and corrosion.

Iron and Steel. It should be used exclusively upon all Iron and Steel work, such as Bridges, Buildings, Roofs, Gas Holders, Elevated Railroads, Railroad Stations and *wherever* it is desirable to *prevent rust.*

PRINCE BROS.' MINERAL BROWN

WAS FORMERLY CALLED

PRINCES' METALLIC PAINT.

To be a Good Paint the dry pigment should combine several qualities:

First. When mixed with oil, it should have sufficient opacity to cover thoroughly with one coat any surface of wood or iron (this shows its covering capacity), and it should have this quality to such an extent that when brushed out carefully a thin coat completely hides the wood or metal from sight, metal especially, as that does not absorb the oil to any great extent.

Second. It should adhere well to metal or wood when mixed with linseed oil.

Third. It should, when used with pure raw linseed oil, dry within a reasonable time, especially in warm dry weather.

Fourth. It should be *Elastic*, that when painted upon Iron or Tin it will expand or contract as they do. Both of these expand and contract with every change of temperature.

Fifth. It should be unaffected by rain, snow or moisture, by smoke or cinders (upon car roofs), or the sulphurous fumes from burning coal.

Sixth. It should be non-poisonous, that workmen may not be injured by it, or water made poisonous if it is used upon the inside of tanks, or upon roofs when rain water is used for drinking.

Seventh. It should be finely ground, so that it will not settle in oil, that it may spread smoothly and make no waste from sediment.

Eighth. It should be durable, for the cost of dry pigment is only about one-tenth the cost of painting, the remaining nine-tenths being spent for oil and labor, and it costs as much, if not more, for oil and labor to apply a poor, worthless paint that will last but a few months, as it does to apply a good one that will protect metal thoroughly for five or six years before it needs renewal.

Ninth. It should not scale, blister, chalk or crack, or change color to a lighter shade.

Tenth. The cost should be moderate, so that any one can afford to buy it.

Eleventh. Mixed with Linseed Oil, it should not run or crawl, using equal weights of pigment and oil.

No Universal Paint has ever been made, and none will be; the nearest approach to it is undoubtedly PRINCE BROS.' MINERAL BROWN, *formerly* called Princes' Metallic Paint. This *fully meets* the eleven requirements specified. It was first introduced to the public in 1858, and has been favorably known to more people in the last 37 years than any other paint that has ever been put upon this market. Its use has steadily increased, the demand for it having been produced *entirely by its own merits*, and not by advertising.

It Has Been Abused by parties having "substitutes" for or adulterations of Linseed Oil to sell, as they almost always urge the sale of their compounds by stating that "they will work well with Metallic Paint," trusting that the merits of the dry pigment will commend the use of their mixtures to the consuming public.

Analysis Tells Much, but Not All. We have had a good many samples of natural Iron Oxides analyzed by eminent chemists, and long ago found out that such analyses are indicative only as far as enabling any one to form an intelligent opinion as to whether an oxide is suitable for use *as a paint* or *not*. An analysis can tell nothing about whether a pigment is durable or not; whether it has much or little covering power; and other qualities *essential* in a *good* paint, as elsewhere specified.

An Illustration. The Diamond and charcoal are both by analysis pure carbon; the difference between them is well known: almost any one would rather own diamonds than charcoal.

Expectations Not Realized. The first and most natural expectation of an inexperienced person, upon learning that a certain mineral contains a *large* percentage of Iron Oxide, is that such a mineral must be a better paint than another containing, perhaps, one-half as much. *This is an error*. It may be put down as a fact that the amount of Iron Oxide in a pigment is no indication whatever of its value as a paint; the *kind* of oxide and *condition* must also be determined.

Samples Tested. We have obtained samples of many natural Iron Oxides offered for sale as paints and found most of them lacked essential qualities for that use. One containing 94% of oxide was

Weak in Color—had scarcely any strength of color, and showed this plainly when rubbed out in oil upon glass, being semi-transparent, and when painted upon a roof disappeared after the exposure of one summer. Another paint containing metal equivalent to

90% Oxide, made from Iron Pyrites, contained about 6% of sulphur, a large per cent. of iron, and a small per cent. of actual available oxide; its specific gravity was so great that when mixed with oil, ready for use, it would promptly sink to the bottom and form a hard cake; if kept constantly stirred and painted upon a tin or iron roof the sulphur and iron absorbed oxygen from the air, changed into the Hydrated oxide of iron or rust, and eventually ate into the roof, *producing corrosion instead of preventing it.*

Iron is Not a Paint, and in a pigment, no matter how finely ground, is one of the worst things that can be painted upon iron or tin ; it is only a question of time, and of a short time too, when the iron or tin painted with a pigment containing it will be filled with pin holes and a new roof required.

Raw Iron Ores. Most of the paints made from *raw* iron ores contain a large per cent. of iron, but the *available oxide is not present.*

Tin Roof Riddled. The writer has seen a tin roof in Toledo, O., that had been painted for one year with a paint made from raw iron ore containing a large per cent. of iron (the available oxide not being in the proper condition), that looked as if it had been riddled with fine shot all over it, making an entirely new roof necessary at a cost 50 times greater than the paint cost.

Red Oxides. To obtain *bright* red oxides it is customary to take Sulphate of Iron (Copperas) and roast it until most of the sulphur has been driven off, the remaining oxide of iron absorbs oxygen and becomes a red; the more thoroughly the sulphur is expelled the darker the color. As light bright shades are the most in demand, and to reduce the cost Terra Alba, Gypsum or Lime is mixed with the red oxide, 4 or 5 lbs. to one of oxide; these are roasted together and then ground; this mixture is called

Venetian Red. Upon wood it answers very well as a bright, handsome paint, but should never be used upon Iron or Tin, as it is often found to contain enough sulphuric acid to be most destructive to them. A very small per cent. of this acid is too much.

Contain Acid. All Iron Oxides made from Sulphate of Iron contain more or less acid. The brighter the color the more acid there is in it.

Drip Pans. The iron drip pans of the Sixth Avenue Elevated Railroad were painted with this kind of paint, and the pitting and rusting of them may be plainly seen by any one.

Hydrated Oxide of Iron. This is simply iron rust (Fe_2O_3, $3HO_2$); it is a yellow color, and forms the coloring matter in Yellow Ochre and Sienna. It is not used as a paint.

Ochre Should Not be Used upon Iron, because it contains from 5 to 15% of moisture, as in the process of manufacture it is washed to eliminate the sand found in it, then air dried (not by artificial heat, because that would change the color from yellow to pink or red, depending upon the amount of oxide in it).

Used 40 Years Ago. Forty years ago all the Iron and Tin roofs in this city were painted with it. Experience proved that the moisture in it was very injurious to the metal it was painted upon; the paint after drying was frequently found to have blisters containing water; this water would gradually evaporate, but it had left its mark in a coat of rust beneath the blister upon the face of the metal that kept increasing with age.

Prince Bros.' Mineral Brown, formerly called Princes' Metallic Paint. When painters and the public found that a paint was in the market that did not have this fault, that was *absolutely free from moisture* and *acid*, and most thoroughly protected the metal it was painted upon, Ochre was discarded and *The Princes'* Paint took its place, and took it to stay, for it is now hard to find a Tin or Iron roof not painted with it.

Extract from an article published August, 1892.

THE COLORING PIGMENTS.

By F. Maire.

"Under this head might be included many pigments of brown oxide of iron origin, such as the Metallic Browns, Brown Mineral, &c. * * * *

It may be well to say that the amount of this class of pigment sold in this country is enormous.

Being *very economical, they are used largely* in painting *structural iron work*, by railroad people in painting *freight cars* and *bridges*, by farmers in painting barns and outhouses. In cities *tin roofs* are mainly painted with this class of pigment.

While their color is anything but beautiful, *they are very durable and economical*, and their use is increasing yearly for that reason.

They deserve this extensive use, and as they form good grounds for other painting over them there can be no serious objection to using them for that purpose." * * * *

From "The Painters' Magazine," July, 1894.

BUYING AND MIXING PAINTS.

By V. B. Grinnell.

"When you are about to mix dry pigments in oil, it is well to remember that yellow ochres, umbers, siennas, and red oxides of iron are liable to contain a large per cent. of water absorbed from the air, and it is also well to remember that the grinder who grinds such pigments without first drying out the hygroscopic moisture is liable to sell you a paint containing from 1 to 14 per cent. of uncombined water. Hence you will see one cause why paints made of these pigments sometimes cause iron and tin to rust rapidly and blister and scale when exposed to the heat of the sun."

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71 MAIDEN LANE, N. Y.

From "Oil and Drug News," March 8, 1881.

RELATIVE DURABILITY OF PAINTS.

In the course of a debate before the Master Car Painters' Convention at St. Louis, on the question as to "Which is the most durable and best adapted to Railway Buildings and Bridges, Iron or Lead Paint?" Mr. Cooley said:

"The proposition suggested combines two subjects, which are just as different as it is possible to make them—iron bridges and wooden buildings. As far as iron bridges are concerned, my experience is that iron paint is the best for them. I had a little experience last summer, on the Burlington and Quincy bridges. The Quincy bridge was painted with two coats of lead. The manufacturer primed it with iron. The same year that the Quincy bridge was painted with lead I painted the Burlington bridge with *Princes' Metallic Paint*, giving it two coats. Last summer I painted both bridges again with metallic paint, and I found the condition of the bridges very different indeed. I examined the bridges myself thoroughly, and I *found that on the Burlington bridge, which was painted five years before with Princes' Metallic Paint, the paint was almost intact*, while the Quincy bridge, that was painted with two coats of lead paint the same year, had very little lead on it. From the top chord and the tops of all the rods the paint had entirely disappeared though the priming or mineral that was put on by the manufacturer, and on the sides, partially protected it. I never painted an iron bridge with lead myself, and that is all the experience I have had with lead and iron paint on iron bridges. As far as wooden bridges and wooden buildings are concerned, I would favor iron paint, as far as durability is concerned. So far as taste and color are concerned, of course light drabs are better, especially for buildings. We *have used iron paint exclusively on all our bridges* on the road that I do business for. We use mineral paint on our cheap buildings, and drabs, shaded, on our better class of houses; both with good results. I think *the mineral paint stands the longer. As far as durability* is concerned, *mineral paint, in my opinion, is better than lead.*"

Mr. Murff—"We paint our depots, freight houses, etc., with *Princes' Metallic Paint.* We paint our window and door casings with white lead; we use both colors entirely mixed with oil. We put two coats of brown mineral paint upon our sid-

ings (the body of the house), and in order to have the job covered thoroughly we put three coats of white lead on the casing, and I find that *three coats of white lead do not stand as well as two of mineral.* Therefore, I believe *brown mineral paint is superior for buildings to white lead.*"

The President—"We adopt the same plan on the C., B. & Q. in regard to our permanent buildings, our stations and so on: we paint them drab; our plain buildings and water tanks, and all such things, *we use mineral paint* on; I *find that mineral paint stands the best;* the other will do for appearance, *but not for durability.*"

The United States Government has adopted the Princes' Metallic Paint for use upon all Naval Ordnance, Cannon, Shot, Shell, &c., to arrest and prevent Corrosion by rust.

The following extracts are made from the *Ordnance Manual* published by the Government in 1880:

"Art. 1094. Before the storage is finally made (referring to guns, shot, shell, &c.) they should be carefully and thoroughly cleaned from rust and all improper coatings, and be well coated externally with the *Princes' Metallic Paint.*

"Art. 1103. The guns should be cleaned from rust, and painted with the *Princes' Metallic Paint*, and then painted black.

"Art. 1108. The carriages are to be carefully examined, the rough iron work painted with the *Princes' Metallic Paint.* All iron work should be freed from rust and painted with the *Princes' Metallic Paint.*"

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Extract from a letter to the "Painters' Magazine," Jan., 1889, *Page* 67.

HOW HE PAINTS IRON TANKS.

KENT, OHIO, December 7th, 1888.

For iron work I use a priming of *Princes' Metallic Paint*, ground in two parts boiled oil and one part Japan reduced with Turpentine. Give two coats of this mixture, puttying and glazing all defects on the first coat, then proceed with the painting of the tank. Your foundation is secure, and *no trouble need be feared from rusting* so long as the paint on the tank is properly cared for. ROBERT MCKEON,

Secretary of the Master Car and Locomotive Painters' Association.

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Convention of Master Car and Locomotive Painters at New York, September 14, 15, 16, 1887.

SUBJECT—"What Constitutes the best Priming Coat of Paint for Locomotives and Tanks?"

Report by John S. Atwater, Hinckley Locomotive Works, Boston, Mass.

"*Mr. President and Gentlemen:*

"The subject of priming on locomotives and tanks is one in which I have been greatly interested in time past, and I have made several experiments with primers of different kinds. I regret that my time has been so taken up that I could not continue the experiments, and prove or disprove some of the theories that I have heard advanced.

So far I have found nothing to equal *Princes' Metallic* and oil for giving hard elastic coatings on which to put the ornamental coats (by ornamental coats, I include the puttying, filling and coloring coats not necessary for durability but for appearance).

No paint has any protective properties on iron except that which is given by the oil.

The question then is what pigment will best unite with the oil and harden and protect the oil, and in so doing protect the iron?

Time is an important factor in the painting of engines, and what would be a durable primer for long-time-work would only be a cause of delay and annoyance on a job which must be done quickly.

I mix my primer with *Princes' Metallic* and one-half turpentine, adding a little Japan if raw oil is used; this I mix thick and grind in a mill, then reduce to working consistency with the oil and turpentine, always keeping the same proportions of oil and turpentine.

Second Coat: Use the same mixture thinned with two-thirds turpentine and one-third oil, then putty and surface on this foundation.

By this method it takes about twelve to fifteen days to bring a tank to, including the first coat of varnish.

Use the same primer on locomotives except on cylinders when painted cold; if primed while hot there is less danger of blistering."

Mr. C. C. Wood, of the Pennsylvania and New York Railroad, also read a paper on the same subject.

"After a careful observation of different tests and formulas, I have discarded the use of white lead entirely for locomotive and car painting, and use *Princes' Metallic* exclusively for priming and second coating on all iron-work on locomotives. I make a thick paste paint of *Princes' Metallic* of the following formula: Two parts rubbing varnish, one part prepared raw linseed oil, one part coach Japan, and thin with turpentine; spread on freely and rub out well, and when possible, let dry for twenty-four hours; then sandpaper thoroughly and apply the second coat of the same formula, and in ordinary weather will dry sufficiently to putty all rough and uneven places in five or six hours. For cabs and tanks I use *Princes' Metallic* and prepared raw linseed oil alone, giving the work three or four days' time before sandpapering. For old work that the paint has been burnt off, I make a paste of *Princes' Metallic*, of three parts oil, two parts rubbing varnish, one part Japan, and thin with turpentine. The prepared oil is raw linseed oil boiled over a slow and moderate fire for two or three hours to evaporate the water that is in the oil. I have used oil prepared this way for years and with good success.

A member inquired "whether Mr. Wood had tried his method on steel," to which he *replied affirmatively*. "He used less oil wherever the paint was placed near a fire. Before painting his tanks he cleaned them with oil, not water, rubbing them down with sandstone and coating them with raw oil until ready to prime."

The Secretary remarked "that while many years ago the only method of painting iron was coating it with white lead, *we had come to discard lead in favor of Princes' Metallic and the agreement was almost universal.*"

Mr. J. McMurtry said "that it was his opinion that *lead tended to create rust.* They used on his line *Princes' Metallic* and ochre, only employing lead to finish with."

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A SILVER MEDAL AWARDED.

From an English Paper, Sept. 19th, 1884.

"Crystal Palace International Exhibition. The highest award, *a silver medal*, has been given at this Exhibition to THE PRINCE MANUFACTURING Co. for Metallic Paint for Iron Work, &c."

USED AS A PRIMER AND SURFACER INSTEAD OF LEAD.

Extracts from the proceedings of the Master Car and Locomotive Painters' Association Convention, held in Buffalo, N. Y., September, 1894.

SUBJECT No. 8—"What formulas which do not contain white lead have proven satisfactory substitutes for lead primers and surfacers, on the outside of Passenger Cars and Locomotives?"

Mr. Chas. E. Copp (Boston & Maine R.R.).

Mr. Copp gave quite a lengthy report upon his experiments with various primers, some containing lead and some not, and wound up by saying:

"I will venture the suggestion that for such cars as are to be painted a dark color, particularly a Tuscan Red, the *Oxide of Iron* be tried as a substitute for the Carbonate of Lead for primer and surfacer, using the usual vehicles, such as linseed oil, Japan and spirits of turpentine in their proper proportions for the various coats, and rubbing all down with block pumice preparatory to putting on the color.

For this purpose I should try *Princes' Metallic* dry, and mix and grind it myself. It seems to me that this ought to give us *all the requisite lasting qualities of lead, without* the injuring ones."

Mr. Fred. W. Wright (Mich. Central R.R.).

* * * * * "It has been my experience, and, from discussions heard at previous conventions, generally admitted, that for iron, *Mineral* (Brown) *is superior to lead for priming.* I gave it several tests, using *Princes' Metallic* paint, *mixed with the same formulas as lead*, and found it to stand equally as well." * * * *

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PRESERVATION OF IRON AND STEEL STRUCTURAL WORK.

Extracts from an article by Chas E. Copp, M. C. P., B. & M RR.

From the Painters' Magazine, July, 1891.

"In the first place, Red Lead contains within itself the elements for its own destruction when mixed with oil as a paint, namely, its intense drying property. It is nothing more nor less than Litharge, further heated to a high temperature in a furnace, under which action it absorbes more oxygen and becomes redder in color. * * * * *

Twenty-five years experience in the painting business has proved to the writer that the best use that can be made of Red Lead is to use it for putty, or give it to the pipers for joints. * * * * *

Painting tin car roofs for twenty years has demonstrated to us *that it is not equal to good oxide of iron* ground in raw oil, for the reason aforesaid, that *it contains the element in it which will burn its own life out as a paint*, and when *that is burned out* its elasticity is gone and its adhesion is measurably departed.

Nine years experience in painting the upwards of one hundred Locomotive Tenders in this division of the B. & M. RR. has shown clearly to the writer that a *first class oxide of iron* is the *best* primer for that purpose, *having tried Red Lead also*, and this is acknowledged to be one of the hardest tests in that line —on account of the rolled and scaly iron to begin with, and the constant action of the varying temperatures of the water within, which is often heated extremely hot by blowing back steam from the locomotive, and is often colder than the atmosphere without, so as to be in a constant sweat. * * * * *

I believe that this application of oxide of iron *of the right kind* to iron to prevent rust is a true homeopathic law or principle, and is as scientific as is vaccination to prevent small pox, or Pasteur's remedy for hydrophobia. * * * * 'Similia Similibus Curantur' may apply to paint as well as to medicine.

It is the effective way of 'fighting the devil with fire.' * * * Red Lead may be best to paint ships' bottoms to be submerged under salt water, as the United States Government has demonstrated. We should want red lead *there*, if anywhere, to stop its fiery drying powers. But a salt water test (submerged beneath it) does not occur to us as pertinent to railway work in general. We have known other paints to stand that test admirably, which were utterly behind in the air, with others, on iron and wood." * * * * *

Extracts from the Master Car and Locomotive Painters' Convention, September 10–12, 1890.

SUBJECT—"What is the best one coat of paint that will hold rust back the longest?"

Mr. Quest—"Mr. President: I tried Red Lead and I should say that I had no better results in the use of Red Lead than with white, but I think I had a little better result in using the *Princes' Metallic* dark shade, and I think *Princes' Metallic* and raw oil, mixed up to a certain consistency—it don't want to be too heavy—and brushed over the work, *will hold back rust longer than keg lead or red lead either*. . . . I would not have any hesitation in saying that oil and *Princes' Metallic* is most de-

cidedly the best thing that can be used, because that is demonstrated right along in Bridge work. I have had some experience in that kind of work, and I find *that is the best thing* that can be put upon it."

Mr. Gohen—"I believe *Metallic Paint* and oil would be *better* to hold the rust back than *red lead* or *white lead*, because I believe *there are chemicals in the white* and *red lead* that would naturally corrode the iron. In *Metallic Paint* you have something of the *same nature as your iron* and some of *the preservative too.*"

Mr. Atwater—"I have not a great deal to offer. I do not know of anything that will keep rust back; that has got to be got off in some way. If there is only one coat to be put on, *oil and Princes' Metallic will hold its own* as long as anything I know of."

Mr. Coleman—"I have not got much to say on it. I use *Metallic* and *boiled oil* together."

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Extracts from Convention Master Car and Locomotive Painters, September, 1889.

QUESTION—"How shall we paint the heated parts of a Locomotive?"

The Chairman—"The question is now before the house, and if any member has anything he would like to say about it, he

can have an opportunity now to do so. I will ask Mr. Gillingham to speak upon the subject."

Mr. Gillingham, Chicago & N. Western—"I am a good deal of a novice in this subject, and would prefer not to make any remarks upon it. I do not know that I could add anything to it. There seems to be a wide divergence of opinion between the gentlemen who have expressed themselves. I notice one or two points there that I might refer to. I do not know how it will work to mix *Princes' Mineral* without a dryer. That is certainly a new experience to me. I will try it. I am glad to obtain this information. The gentleman back of me spoke of a subject that I never heard of before; that is, black filling. With regard to the sand boxes and domes, and parts of locomotives that become heated, we do not have any time to put on any filling on the Chicago & Northwestern road; they want it too soon. The best thing we can use is an oil priming, and *I use Princes' Mineral*, and I put the black on it. I use an oil priming and ivory black, a coat of rubbing varnish, a coat of finish varnish, and our job is done. Our tanks we fill. I give them one, and where it is a new tank I try to give them two coats of priming of *Princes' Mineral*, boiled oil, japan and turpentine. I fill with a putty composed of dry lead and *Princes' Mineral*, mixed with rubbing varnish, Nonpareil Japan and boiled oil. We rub that smooth with pumice stone where we have time. We usually have a little more time on our tanks than on the engine. After being rubbed, we give them a thin coat of oil, lead color priming, well brushed out, and then flat black and varnish, rubbing the varnish."

The Chairman—"What portion of oil do you use in the priming, and do you use boiled or raw oil?"

Mr. Gillingham—"Boiled oil. I should say about six parts of boiled oil to two of japan and four of turpentine."

Mr. Samuel Brown, Old Colony, Boston, Mass.—"Mr. President and gentlemen: The discussion of all these questions, to my mind, is simply giving our personal experience. What we use for priming is a preparation of *mineral and lead.* The idea of adding the lead to the mineral is that we have the impression that it helps to make it combine together; it prevents a little separation as it were. *Mineral is a very good article—grand.* We had a discussion at our New York Convention, *and it was conceded there by a large majority of the members that minerals were the thing for iron work*, and to give a little

more body and solidity to it the addition of a certain portion of lead was a good thing. That has been my experience in painting iron."

Mr. Lowrey—"I have had some experience in connection with locomotive painting, yet I do not wish to say anything. The gentleman at the corner of the table does what I do ; that is, to prime *with Princes' Mineral* and a quantity of oil, two-thirds turpentine and the balance japan, and get on as little material as you can and get service. The purpose is to get your varnish to protect your paint. This is my experience in treating the heating parts of the locomotive."

Mr. Wm. O. Quest, Pittsburg & Lake Erie—"*The gentlemen all appear to be pretty unanimous in the use of Princes' Metallic as a primer, and that is my mode when I have time.*"

Extract from an Article by C. B. Dudley, Chemist of the Pennsylvania R. R. Co.

"We are quite free to confess that in our experience we have not been able to confirm the common belief among paint manufacturers, and indeed among many of the users, that the oil is the life of the paint. The *pigment* is the life of the paint according to our experience. In reality, the pigment protects the oil from decay, if it is present in proper amount, and still further is of the proper kind. A single thought seems to us to have very much weight in this connection, namely, with such pigments, for example, as *Oxide of Iron, which undergo no chemical change in centuries of exposure*, it is obviously the oil which decays and wastes away. Even though the pigment has fallen off from the surface, it is still oxide of iron, and is unchanged. Not so with the oil; it is constantly undergoing slow decomposition, and in reality the wear and wasting away of paint is largely the decay of the oil. This statement, of course, only holds true where there is no chemical action between the oil and the pigment. * * * * It is sufficient for our purpose here to put clearly on record that we regard it as an essential of good paint that the amount of pigment per square inch or square foot of surface should be large."

The remarks of Dr. Dudley quoted above coincide with our own opinion, viz., that the proper proportion to use of the *Prince Bros.' Mineral Brown* pigment is 7½ lbs. to one gallon (7½ lbs.) of pure Linseed Oil.

Red Lead as a paint for iron has been strongly pushed to the front within a few years, and many claims made for it that are extravagant and unreasonable.

It Contains an Excess of Oxygen. It is made by melting lead and blowing air for a long time upon the surface. The oxygen is absorbed in large quantities, changing the color to a bright yellow red, but semi-transparent and having but little covering power. Its chemical symbol is Pb_3O_4.

Holds Oxygen Loosely. There is no other pigment known that contains so much oxygen, or that holds it so loosely, or gives it up so readily as red lead, holding it much as a sponge holds water, "until it is squeezed." When red lead is brought into contact with something for which the oxygen has a greater affinity than it has for lead it at once leaves the lead and combines with its affinity. Linseed Oil and Iron both have a greater affinity for oxygen than *it* has for Lead; hence it readily combines with both of these.

It Makes "Drying" Oil. Two or three pounds of Red Lead if heated in 100 lbs. of Raw Linseed Oil will promptly give up its excess of oxygen to the oil, partly oxidizing it and changing it from a slow drying to a quick drying oil, for the "drying" of oil means simply that the oil has absorbed from air or other sources sufficient oxygen to harden it in less time than without it.

If Iron is painted with Red Lead paint, corrosion is not prevented, but produced, *the Red Lead covers it up* and *keeps it out of sight*, and the rusting goes on beneath it just the same.

Painters object to using Red Lead, not only because it is high priced, but because it is coarsely ground, settles in the pot, becomes hard and has to be thrown away.

Red Lead is poisonous if *absorbed* into the human system, and further, *is a cumulative* poison.

PRINCE BROS.' MINERAL BROWN

WAS FORMERLY CALLED

PRINCES' METALLIC PAINT.

DO YOU KNOW THIS?

Rust Joints are generally made, when Iron Pipes are to be joined permanently together, by smearing the screw threads of each piece of pipe *with Red Lead* and then screwing them together. The red lead quickly *oxidizes* and *rusts* the *iron* to such an extent that the joint cannot be unscrewed again.

Steam Pipe Fitters and Gas fitters know this. Every chemist knows and will confirm it. Engineering students in Technical Colleges are taught to make Rust Joints in this way.

Red Lead runs when applied as a paint. It is so very much heavier than the oil that, when painted upon a perpendicular surface, the first coat is sure to run, the lead separating from the oil and running down in streaks. After this has dried, the second coat is held better in suspension, being supported by the rough first coat, and it does not run as much as the first coat.

Red Lead is Coarse, because if finely ground the oxygen is to a certain extent separated from the lead, and the color is changed to a dull red shade.

Red Lead becomes hard when mixed with linseed oil. The oxygen from the lead oxidizes the oil very quickly; if left standing over night in the painter's pot, it hardens so much that it cannot be used.

Red Lead cannot be ground into a paste with oil for the same reason, it becomes a solid mass in a very short time.

Red Lead can only be used by mixing a small quantity with oil by hand, and using it all up at one time.

This property of drying up oil so quickly and becoming hard has led to its use upon Iron and Steel ships.

Red Lead Paint, ready for use, is made "by mixing 20 lbs. of Red Lead with 5½ lbs. of Linseed Oil, and this makes *one gallon of paint.*"

Now bear in mind that twenty lbs. of Red Lead contain sufficient oxygen to oxidize *800 lbs.* of Linseed Oil. "2½ lbs. of red lead to 100 lbs. of oil" being the proportion mentioned in a pamphlet recently issued, what is and what *must* be the result when this oxygen battery is turned loose upon a poor little 5½ lbs. of oil? It dries it

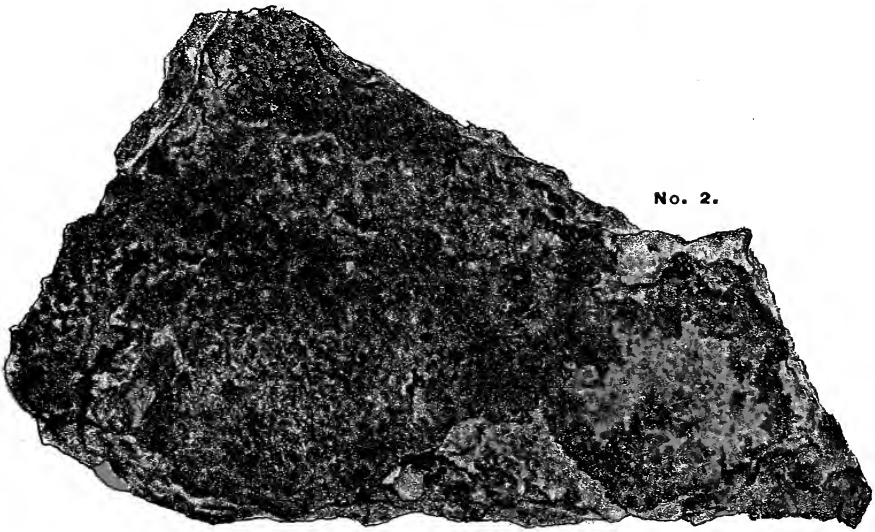
up of course, the little drop of oil takes up all the oxygen it *can* take up, which is just about $\frac{1}{160}$th of the oxygen present, and the remainder of the oxygen, like a hungry lion, is ready to devour anything else that it can find conveniently near. If that happens to be iron, it takes hold of that with avidity *and combines with it, making a coat of Iron Oxide beneath the Red Lead.* The Red Lead paint remains hard upon the surface—tells no tales—covers up the mischief it has done; but when the second coat of Red Lead is applied, the excess of oxygen passes through the first coat of paint and Iron Oxide, combines with the iron and forms *another coat of Iron Oxide behind* the first one.

The third coat of Red Lead acts exactly like the second one, piling up the Iron Oxide in the rear, and so on continuously, every additional coat of Red Lead producing the same result.

Red Lead upon Iron Vessels, Bridges, &c. The users believe that, because it dries quickly and becomes hard upon the surface, it protects the metal beneath it from rust and corrosion. This we know to be an error. We know of an iron vessel that had been painted before leaving the stocks with two coats of red lead upon the inside of the hull and one coat annually over this for five years, making seven coats in all. The owner believed his boat was in the best possible condition, but upon cutting through the seven coats of red lead, which were hard, with a hammer and chisel, it was found that *the iron had corroded beneath the red lead* and formed into layers of scale (rust) $\frac{4}{16}$ths of an inch in thickness, while the outside coating of red lead was $\frac{2}{16}$ths of an inch thick (the original thickness of the iron was $\frac{5}{8}$th of an inch). The owner had all of the red lead and *iron scale* carefully cleaned off the hull, this made 40 cart loads in bulk, and then painted the hull with an anti-corrosive paint made from Prince Bros.' Mineral Brown. This was three years ago, and since then he has had no further trouble.

A colored photograph of some of this *Red Lead* and *Iron Scale* is on the opposite page, and *the original specimen* may be seen by any one calling at our office.

No. 1.



No. 2.

No. 3

No. 4

FROM THE PRINCE MANUFACTURING CO.,

71 MAIDEN LANE, NEW YORK.

PHOTOS OF BLACK IRON OXIDE SCALE,

PRODUCED BY PAINTING THE INSIDE OF THE HULL OF AN IRON STEAMBOAT WITH

SEVEN COATS OF RED LEAD.

No. 1. FRONT VIEW OF SCALE, SHOWING RED LEAD SURFACE.
No. 2. BACK VIEW OF SCALE, SHOWING BLACK IRON OXIDE AND RUST.
Nos. 3 and 4. EDGE VIEWS, SHOWING COMPARATIVE THICKNESS OF THE RED LEAD, AND THE BLACK IRON OXIDE IT PRODUCED.

SIX CASES OF LEAD POISONING.

From "The Press," New York, November 6th, 1894.

"Mrs. Joseph Donnanly, of Evergreen, Ohio, died, and her three sisters and father are not expected to live, from the effects of drinking poisoned rain water." *The roof of their house had been painted with White Lead.*

INTERESTING CASE OF POISONING.

From "Oil, Paint and Drug Reporter," November 25, 1885.

"Dr. Bartley, Chemist to the Brooklyn Board of Health, reports an interesting case of lead poisoning which was caused by using water from a tank on shipboard *which had been painted nine months before with Red Lead.*" (If *Princes' Mineral Brown* had been used instead of lead these lives would have been saved. There is *no poison in that.*)

COMPARE THE COST!!

Two coats of Red Lead paint will not cover iron as well as one coat of *Princes' Mineral.*

A gallon of Red Lead paint contains	
20 lbs. Red Lead @ 5 cents lb., . . .	$1.00
5½ lbs. Raw Linseed Oil, @ 50 cents per gall.,	.36½
Time to apply it, say, ...	1.00
Cost of one coat, ...	$2.36½

But as *two coats are necessary,* the cost would be $4.73 ; this will cover 755 square feet, equal to 63 *cents per* 100 *square feet.*

Compare this with the cost of *Princes' Mineral,* which with one coat completely covers iron.

A gallon of *Princes' Mineral* contains	
6¼ lbs. *Princes' Mineral* at say 1½ cents lb., .	$0.09½
6¼ lbs. Raw Linseed Oil at 50 cents gallon, .	.43
Time to apply, say, ...	1.00
Cost of one coat, ...	$1.53

This will cover 700 square feet, equal to 22 *cents per* 100 *square feet.*

Which is the wisest—to pay 63 cents to put a *destructive* paint upon iron ; or to pay 22 cents for a paint that *preserves* and *protects it?* The wise man says "Give me *Princes' Mineral* every time."

HAS USED IT 26 YEARS.

KANSAS CITY, ST. JOSEPH & COUNCIL BLUFFS R. R. Co.
ST. JOSEPH, Mo., Dec. 20th, 1893.

THE PRINCE MANUFACTURING Co., 71 MAIDEN LANE, N. Y.:

GENTLEMEN: "Ring off" I have been using your paint for 26 years. When I find a better mineral paint than yours I will write and let you know.

I am a friend to your mineral and show it to other firms' agents when I meet them. I use 25 barrels a year and will use much more next year.

Respectfully yours,
C. F. HARRALL,
M. C. P.

"RED LEAD BECOMES UNFIT FOR USE."

From "Western Painter," September, 1894, *p.* 304.

"Red Lead has a remarkable effect upon drying oils, solidifying them rapidly. Linseed oil and red lead made up as a paint thickens in the pot and becomes unfit for use in forty-eight hours. If japan or varnish be added to the paint, it will thicken while it is being used and be unfit for use in a few hours."

PRINCE BROS.' MINERAL BROWN

WAS FORMERLY CALLED

PRINCES' METALLIC PAINT.

"A Double Label"

"Is Our Trade Mark."

THERE IS NO BETTER PAINT IN THE WORLD.

CHICAGO & EASTERN ILLINOIS R. R. CO.
DANVILLE, ILLS.

THE PRINCE MANUFACTURING CO., 71 MAIDEN LANE, N. Y.:

GENTLEMEN: I will say we have used *Princes' Metallic Paint* for the last 6 years, and I would not use any other. We use it altogether upon engines and freight cars. We buy it dry and grind it in boiled oil. It costs the company 45 cents a gallon mixed ready for use, and *there is no better paint in the world.* We use in the summer time 5 to 6 barrels a month. A box car well painted with *Princes' Mineral Paint* ground in pure linseed oil will last the life of the car.

I remain yours truly,

F. W. FOOTE,
M. C. P.

PRINCE BROS.' MINERAL BROWN

WAS FORMERLY CALLED

PRINCES' METALLIC PAINT.

"A Double Label"

"Is Our Trade Mark."

Extract from an Article upon "Painting Car Roofs."

By Chas. E. Copp, M. C. P.

"What is the best paint for car roofs, and about how often should they be painted? is a question pertinent to the railway paint shop. Presuming that the steam car roof, freight or passenger, is covered with tin, as most of them are now, there is, to our mind, nothing better to paint it with than *the best metallic or iron ore paint*, mixed with the best raw linseed oil; that is, provided it is to go on the bare new tin. If the roof has been spoiled by daubing it over in the first place with an improper mixture, I do not know as it makes much difference what you put on next. A good foundation is necessary to permanent after work and durable finish, whether it is the building itself or the paint put upon it. But perhaps some prefer a *white lead* priming for the bare tin with a portion of the mineral (paint) in it to color it. Having tried it, *I see no advantage* in it. *White lead has no superiority over metallic paint* in adhesion to tin when exposed to long wear. Again there are many advocates of *Red Lead* as a primer for tin. I have so used it and must again confess that *I can say nothing in its favor over the Metallic Paint* put right onto the tin. The adhesion is in the oil, and not the pigment; and for that reason *and because red lead is such an inveterate drier, I believe the very elements of destruction are in it to burn out the vitality of the oil and make it lose its elasticity and adhesion sooner than other pigments, and thus cause it to crack, flake, or shell off in a shorter time when it is racked and jarred, as a car is*, when jacked up, or run over switches at a fearful speed. There are no pores to tin into which the paint can percolate and clinch and hold on with a death grip, when its vitality has gone out of it. *I have seen nothing better for roofs than Princes' Metallic and oil.* If you can get a reliable house to furnish this to you ground and ready mixed, it is well; if you can do it yourself, it is better."

PRINCE BROS.' MINERAL BROWN

WAS FORMERLY CALLED

PRINCES' METALLIC PAINT.

PAINTING FREIGHT CARS.

Extracts from Proceedings at the Master Car Painters' Convention, September, 1891.

QUESTION FOR DISCUSSION—"What materials do you use and how long do you take to paint freight cars?

Mr. Lord (of the Fitchburg R. R.)—"The paint we use is *Princes' Metallic.*"

The President, Mr. Gohen (of the Chesapeake & Ohio R. R.)—"We use a mixed paint that comes in paste form, the base of which is *Princes' Metallic.* We do them in about three days, sometimes we have them longer; we give them a coat a day, three coats. We coat in the morning and stencil in the afternoon."

Mr. McKeon (of the Penn. & Ohio R. R.)—"In regard to painting freight cars, I would say, we paint them in three days, old cars, and that is about all we have; old cars we give two coats; whatever puttying there is to do we do first, and give it a coat each day and stencil them in the afternoon of the second day, and we have the cars completed inside of two days. We use *Princes' Metallic* and boiled oil. The Metallic comes in paste form and we thin it down."

QUESTION—"What is the best formula for preparing floor paint for passenger cars?

Mr. Given (West Shore R. R.)—"I use *Princes' Metallic* for the last coat."

Mr. Stout (B. & O. R. R.)—"We use the Metallic and turpentine and oil."

"IS WELL PLEASED WITH IT."

LITTLE ROCK & MEMPHIS RAILROAD COMPANY,
ARGENTA, ARK., December 12th, 1893.

THE PRINCE MANUFACTURING CO., 71 MAIDEN LANE, N. Y.

DEAR SIRS: We have used your Metallic Paint for many years on this road, and I am well pleased with it.

Very respectfully yours,

F. MATTICE,
Foreman Car Painter.

"IT GIVES GOOD SATISFACTION."

BURLINGTON ROUTE,
CHICAGO, BURLINGTON & QUINCY RAILROAD,
BURLINGTON, IOWA, June 30th, 1893.

THE PRINCE MANUFACTURING CO., NEW YORK :

GENTLEMEN : I have been using your Metallic Paint on freight cars and buildings for many years, and have found it giving good satisfaction. I recommend it for bridges, and have just started a gang of painters to paint our *Iron Bridges* with it, of which *we have over fifty* to be painted this season.

Princes' Mineral will be used instead of *Red Lead* as used heretofore, as I have no doubt it will give better results.

Yours truly,
FRED JOHNSON,
Foreman Painter.

PRINCE BROS.' MINERAL BROWN

WAS FORMERLY CALLED

PRINCES' METALLIC PAINT.

HE FIGHTS FOR IT.

LEHIGH VALLEY R. R.,
SAYRE, PA., Sept. 12th, 1893.

MR. D. PRINCE, Secretary,
THE PRINCE MANUFACTURING CO., NEW YORK :

DEAR SIR : I have used your *Princes' Metallic* whenever I could get it for the last 23 years, ever since I have been in the employ of the Lehigh Valley R. R. I never had any trouble in getting your brand of Metallic, until a few years ago the "Rutherford" brand came into market, and since then I have had trouble, as *the Rutherford is too coarse and gritty* for Locomotive painting.

Will you please send me a sample of your Metallic, as I am entirely out of it and *have been fighting for it for over a year.* I want the sample to convince our store-keeper that there is a very great difference between the two paints.

Yours truly,
CHAS. C. WOOD,
Master Locomotive Painter.

PRINCE BROS.' MINERAL BROWN

WAS FORMERLY CALLED

PRINCE'S METALLIC PAINT.

"A Double Label"

"Is Our Trade Mark."

HAS USED IT FOR THIRTY YEARS.

C. B. & N. R. R. Shops,
Grand Crossing, La Crosse, Wis.

The Prince Manufacturing Co., New York:

Gentlemen: I have used your Metallic Paint for the past thirty years, and use it now on all freight cars. I also use it in combination on all passenger coach and locomotive work, and have found it to be all that you claim for it. This is unsolicited.

Yours truly,
J. K. Lowery,
Foreman of Paint Dep't.

FOUND NOTHING ELSE EQUAL TO IT.

Burlington & Missouri River R. R. Co.,
Plattsmouth, Neb., Dec. 4th, 1893.

David Prince, Esq., 71 Maiden Lane, N. Y.:

Dear Sir: We have been using *Princes' Mineral* on the B. & M. R. R. for the past 17 years. We have tried others during that time, but have found nothing to compare with the *Princes' Mineral.*

Yours,
D. B. Smith, Foreman Painter,
Drawer 1168.

IT IS THE MOST ECONOMICAL AND DURABLE.

West End Street Railway Company,
General Offices, 81 Milk Street, Boston,

Nov. 29th, 1893.

The Prince Manufacturing Co., 71 Maiden Lane, N. Y.:

Dear Sirs: I will say that I have used your paint during the past ten (10) years with entire satisfaction.

I consider it the most *economical* and *durable* paint I ever handled.

Yours very truly,

H. L. Libby, M. P.

PRINCE BROS.' MINERAL BROWN

WAS FORMERLY CALLED

PRINCE'S METALLIC PAINT.

"A Double Label"

"Is Our Trade Mark."

The final conclusion is, if you wish to preserve Iron or Steel from corrosion, paint them with PRINCE BROS.' MINERAL BROWN and pure Linseed Oil, but do NOT use RED LEAD.

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